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STANDARD CHLORINE OF DELAWARE, INC.

GOVERNOR LEA ROAD • P.O BOX 319 • DELAWARE CITY, DELAWARE 19706

October 20, 1989

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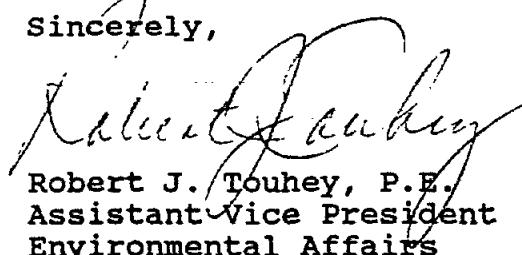
Ms. Diane Wehner
Environmental Scientist
DNREC
715 Grantham Lane
New Castle, Delaware 19720

Dear Ms. Wehner:

In accordance with Paragraph 6 of the Consent Order between Standard Chlorine of Delaware, Inc. and the Delaware Department of Natural Resources and Environmental Control, we are hereby submitting the Seventh Quarterly Groundwater Monitoring Report.

Please feel free to contact me if you have any questions.

Sincerely,



Robert J. Touhey, P.E.
Assistant Vice President
Environmental Affairs

RJT/dab
Enclosures

cc: A. R. Sinibaldi
T. E. Pierson
B. V. Bowers

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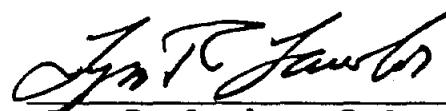
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STATE OF DELAWARE
DNREC SUPER FUND BRANCH

QUARTERLY MONITORING REPORT
GROUND WATER RECOVERY OPERATIONS

STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE



Lyn R. Lawlor, P.G.
Project Geologist



Thomas A. Drew, P.G.
Project Manager

20 October 1989

PREPARED BY:

ROY F. WESTON, INC.
WESTON WAY
WEST CHESTER, PENNSYLVANIA 19380

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QUARTERLY MONITORING REPORT
GROUND WATER RECOVERY OPERATIONS

STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE

In response to the 22 January 1988 Consent Order between the Delaware Department of Natural Resources and Environmental Control (DNREC) and Standard Chlorine of Delaware, Inc., this quarterly report has been prepared to document monthly withdrawal rates and contaminant recovery at the pumping wells; and quarterly sampling results and water level data for the recovery and monitor wells. The report also contains an evaluation of the effectiveness of the recovery system and recommendations to improve the system. Documentation presented in this report covers the quarterly period from July to September 1989.

EVALUATION OF THE RECOVERY SYSTEM

The average monthly withdrawal rates from recovery wells RW-1 through RW-4 are presented in Table 1. Recovery wells RW-2 through RW-4 pumped almost continuously for the quarter, except for short period of downtime each month due to routine maintenance. Average monthly withdrawal rates at RW-1 through RW-4 ranged between 3.4 and 11.4 gpm.

Increases in pumping rates observed in June 1989, following mechanical surging of the recovery wells, have continued through this quarter. Pumping rates this quarter have slightly increased or remained constant with the June 1989 pumping rates.

Recovery well RW-1 pumped almost continuously during July and August, except for short periods of down time due to maintenance. During the month of September RW-1 was not pumping for 20 days due to a broken pipe fitting on the pump. A pump of increased capacity was installed in RW-1 on 29 September 1989 and pumping was resumed at approximately 15 gpm.

The flow meter on RW-2 became inoperable on 9 September 1989. RW-2 continued pumping while repairs were made. The repaired flow meter was installed on 3 October 1989.

Automatic water level control devices have been installed on RW-1 and RW-3 during this quarter. The automatic water level control device was installed on RW-4 on 10 October 1989.

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Ground water level data collected at the recovery and monitoring wells on 14 and 15 September 1989 were used to construct a water level contour map presented in Figure 1. This map represents actual water levels observed while the recovery wells were pumping. A complete summary of these water level data is presented in Table 2.

Monthly concentrations of organics recovered at RW-1, RW-2, RW-3, and RW-4 are presented in Table 3. The average monthly concentrations of total benzene species at recovery wells RW-1 and RW-4 ranged from 40.77 to 61.17 ppm. Recovery well RW-2 showed an average concentration of approximately 250 ppm total benzene species for the quarter. Recovery well RW-3 showed an average concentration of 149.58 ppm total benzene species in September. A summary of the total and individual benzene species from the 7 September 1989 sampling event are presented in Tables 4 and 5 respectively. As shown in Figure 2, an isoconcentration map of the total benzene species for 7 September 1989 is comparable to the concentrations reported in the last quarterly report. However, the anomalous concentrations at TW-49 and TW-50 are not evident during this quarter.

Summaries of monthly and cumulative ground water withdrawals and contaminant recovery for each well and for the total recovery system for 1989 were prepared. The data for individual recovery wells are presented in Tables 6, 7, 8 and 9; the monthly and cumulative results for the entire system are presented in Table 10. The data indicates that the total benzene species recovered has increased reflecting the increase in pumping rates of the four recovery wells.

RECOMMENDATIONS

1. An assessment of the well yield and drawdown at RW-1 will be performed. These results will determine the need to install similar pumps in RW-3 and RW-4 in order to reach our goal of maximizing drawdown.
2. Standard Chlorine has received one bid for the installation of a new recovery well near TW-6A. Additional bid requests have been sent to prospective well contractors. Bids from these contractors will be reviewed this month in anticipation of selecting a contractor in November.

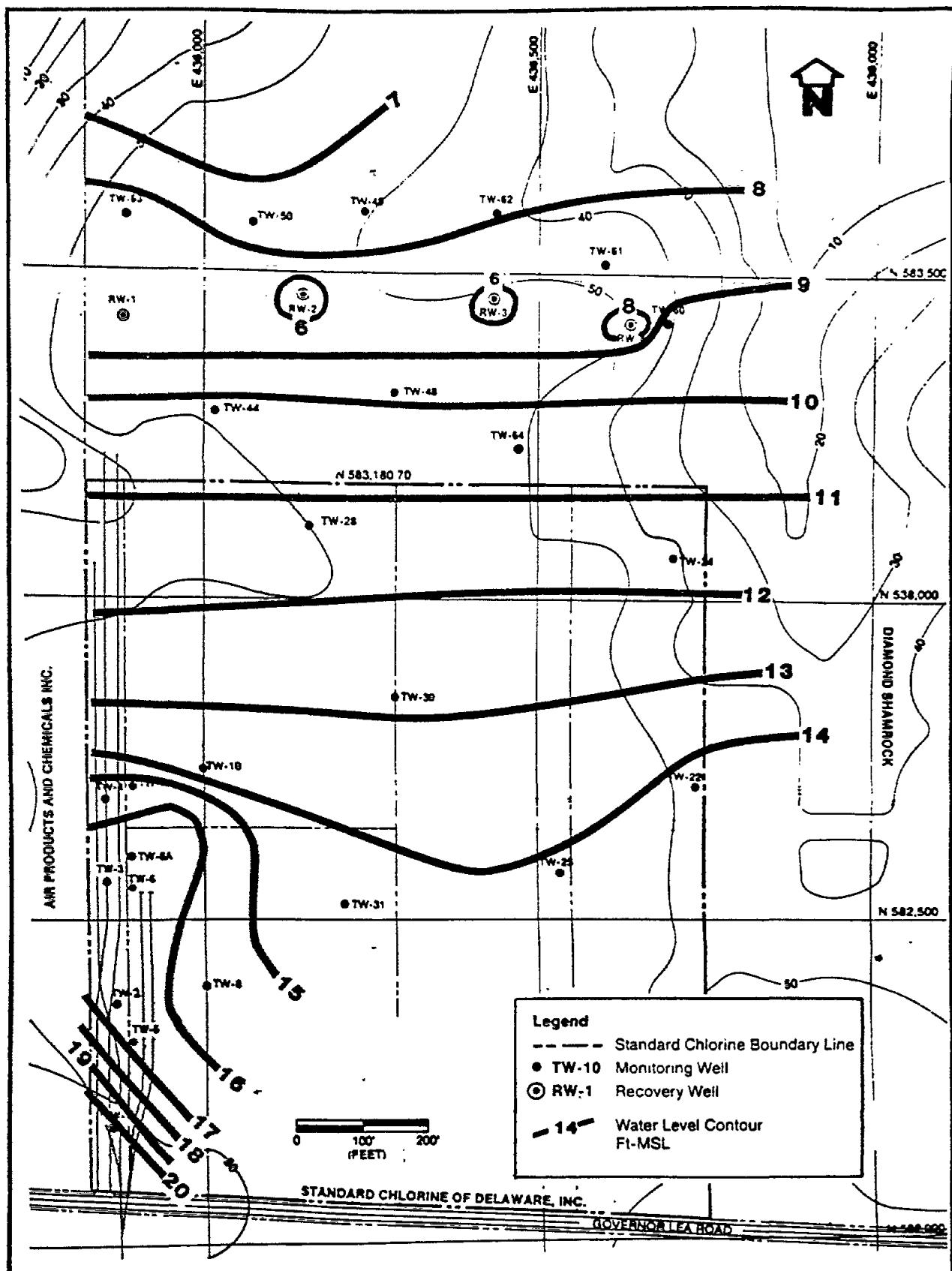


FIGURE 1 WATER LEVEL CONTOUR MAP - 15 SEPTEMBER 1989

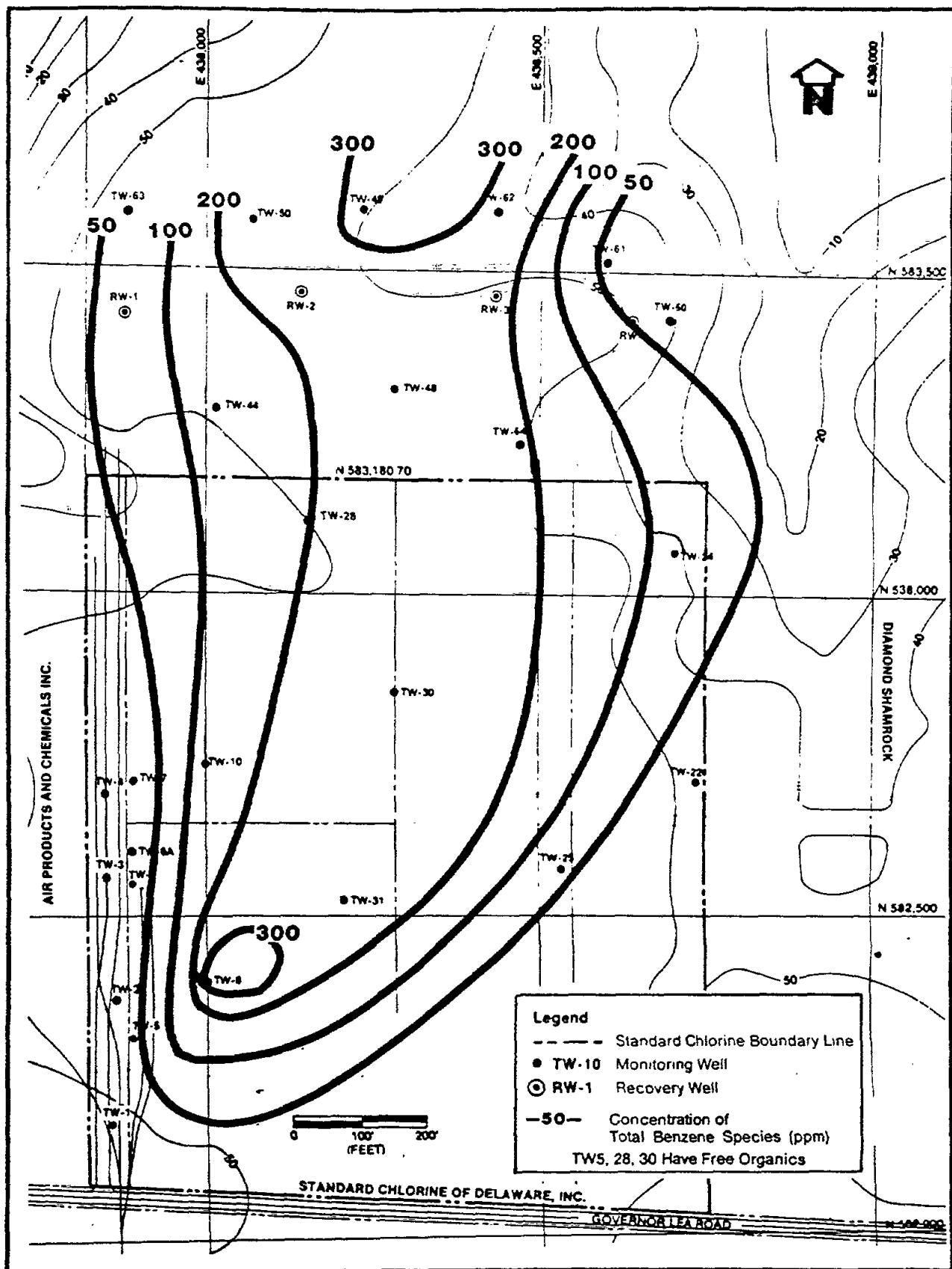


FIGURE 2 IOSCONCENTRATION MAP OF TOTAL BENZENE SPECIES,
7 SEPTEMBER 1989

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TABLE 1

AVERAGE MONTHLY WITHDRAWL RATES (GPM)
GROUNDWATER RECOVERY WELL SYSTEM

STANDARD CHLORINE OF DELAWARE, INC.

<u>MONTH (1989)</u>	<u>RW-1</u>	<u>RW-2</u>	<u>RW-3</u>	<u>RW-4</u>
July	8.6 PD = 2 days	4.8 PD = 2 days	7.3 PD = 2 days	7.0 PD = 2 days
August	11.4 PD = 4 days	4.1 PD = 4 days	8.6 PD = 4 days	10.7 PD = 4 days
September	9.8 PD = 20 days	3.4* PD = 2 days	7.0 PD = 2 days	9.3 PD = 2 days

PD - pump down

* - estimated withdrawn rate, flow meter down for 9 days.

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TABLE 2

GROUNDWATER LEVEL DATA
STANDARD CHLORINE OF DELAWARE, INC.
14 and 15 SEPTEMBER 1989

<u>Location</u>	<u>Measuring Point Elevation (Ft. MSL)</u>	<u>Depth to Water (Ft.)</u>	<u>Groundwater Elevation (Ft. MSL)</u>
TW-1	49.90	29.83	20.07
TW-2	56.10	39.25	16.85
TW-3	56.30	39.75	16.55
TW-4	55.00	39.75	15.25
TW-5	50.10	33.50	16.60
TW-6	50.70	34.50	16.20
TW-7	50.40	34.58	15.82
TW-8	52.20	37.00	15.20
TW-10	50.50	37.08	13.42
TW-22	51.62	37.50	14.12
TW-24	49.44	38.08	11.36
TW-25	49.44	35.42	14.02
TW-28	52.82	41.42	11.40
TW-30	52.29	39.42	12.87
TW-31	50.36	36.16	14.20
TW-49	55.71	47.92	7.79
TW-50	53.28	46.16	7.12
TW-60	46.44	37.16	9.28
TW-61	45.50	37.08	8.42
TW-62	48.92	40.92	8.00
TW-63	53.83	45.58	8.25
TW-64	53.48	43.25	10.23
RW-1	54.75	46.08	8.67
RW-2	52.99	63.92	-10.93
RW-3	45.55	40.42	5.13
RW-4	48.08	40.92	7.16



TABLE 3

MONTHLY CONCENTRATIONS OF TOTAL BENZENE SPECIES (ppm)
GROUNDWATER RECOVERY WELLS

STANDARD CHLORINE OF DELAWARE, INC.

<u>MONTH (1989)</u>	<u>RW-1</u>	<u>RW-2</u>	<u>RW-3</u>	<u>RW-4</u>
July	48.49	243.19	*	40.77
August	52.05	252.64	*	41.61
September	61.17	255.41	149.58	55.14

* No samples collected - Pump Inoperable during sampling event.

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TABLE 4

QUARTERLY SAMPLING RESULTS
MONITOR AND RECOVERY WELLS

STANDARD CHLORINE OF DELAWARE, INC.

7 SEPTEMBER 1989

<u>Location</u>	Total Benzene Species Concentrations (PPm)
TW-1	8.16
TW-2	7.84
TW-3	0.68
TW-4	1.94
TW-5	*
TW-6A	57.64
TW-7	28.47
TW-8	307.14
TW-10	141.99
TW-22	3.86
TW-24	94.22
TW-25	50.45
TW-28	*
TW-30	*
TW-31	250.64
TW-49	301.57
TW-50	274.09
RW-1	61.17
RW-2	233.89
RW-3	**
RW-4	48.28

* Free organics in well

** No samples collected - pump inoperable

TABLE 5

WATER QUALITY DATA
INDIVIDUAL BENZENE SPECIES
MONITOR AND RECOVERY WELLS
STANDARD CHLORINE OF DELAWARE, INC.
7 SEPTEMBER 1969

Well	pH	C6H6	MONO	METH	PARA	ORTHO	135	124	123	NB	1245	1234	MCNB	PENTA	HEXA	TOTAL CHLORO- BENZENES
TW-1	6.2	0.08	5.37	0.14	1.34	1.07	0	0.15	0	0	0	0	0	0	0	0.16
TW-2	6.7	0.08	5.25	0.13	1.30	1.06	0	0.02	0	0	0	0	0	0	0	7.84
TW-3	6.6	0.04	0.18	0.15	0.15	0.15	0	0.01	0	0	0	0	0	0	0	0.60
TW-4	6.8	(0.20)	0.48	0.04	0.52	0.53	0	0.11	0.02	0	0.01	0.03	0	0	0	1.94
TW-5	4.4	FREE ORGANICS														
TW-6A		0.33	23.62	0.31	23.62	8.86	0	0.70	0.11	0	0.06	0.03	0	0	0	57.64
TW-7	4.6	0.88	3.81	2.55	13.36	6.72	0	0.86	0.24	0	0.02	0.03	0	0	0	28.47
TW-8	5.4	37.15	115.21	3.33	17.17	129.96	0	3.46	0.66	0	0.08	0.12	0	0	0	307.14
TW-10	5.7	52.74	29.59	4.22	46.86	8.44	0	0.07	0.06	0	0	0.01	0	0	0	141.99
TW-22	7.2	0.22	1.06	0.08	1.28	1.16	0	0.05	0.01	0	0	0	0	0	0	3.86
TW-24	7.1	0.33	1.14	0.75	10.71	61.09	0	0.14	0.02	0	0.02	0.02	0	0	0	94.22
TW-25	7.0	0.61	0.15	0.89	1.22	47.45	0	0.10	0.01	0	0.01	0.01	0	0	0	50.45
TW-28	4.7	FREE ORGANICS														
TW-30	7.2	FREE ORGANICS														
TW-31	7.0	119.79	67.14	2.83	33.80	26.97	0	0.10	0.01	0	0	0	0	0	0	250.64
TW-49	5.4	104.98	107.58	4.30	45.44	39.00	0	0.22	0.02	0	0.02	0.01	0	0	0	301.57
TW-50	7.0	115.80	81.12	5.88	34.43	36.80	0	0.03	0.01	0	0.01	0.01	0	0	0	274.09
RS-1	6.1	8.64	9.96	3.39	22.13	8.31	0	0.06	0.01	0	0.03	0	0	0	0	61.17
RS-2	4.2	89.38	90.80	2.30	27.11	23.94	0	0.23	0.04	0.09	0	0.01	0	0	0	233.89
RS-3		PUMP DOWN														
RS-4	5.4	1.53	3.85	1.14	8.13	33.56	0	0.05	0.01	0	0	0.01	0	0	0	48.29

Legend

- C6H6 - Benzene
- MONO - Monochlorobenzene
- META - Methylchlorobenzene
- PARA - Paradichlorobenzene
- ORTHO - Orthodichlorobenzene
- 135 - 135 Trichlorobenzene
- 124 - 124 Trichlorobenzene
- 123 - 123 Trichlorobenzene
- NB - Nitrobenzene
- 1245 - 1245 Trichlorobenzene
- 1234 - 1234 Trichlorobenzene
- MCNB - Monochloronitrobenzene
- PENTA - Pentachlorobenzene
- HEXA - Hexachlorobenzene

- All concentrations in mg/L

Table 6

**Monthly and Cumulative Montior Well Pumpage
and Contaminant Recovery**

Recovery Well RW-1

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gallons x1000)	Average Monthly Concentrations of Total Benzene Species Recovered (mg/l)		Cumulative Total Benzene Species Recovered (kilograms)
				Total Benzene (mg/l)	Species Recovered (kilograms)	
1989						
January	5.4	241,056	241	47.29	43.1	43.1
February	4.9	197,568	439	35.09	26.2	69.3
March	4.6	205,344	644	57.9	45.0	114.3
April	4.7	209,808	854	46.1	36.6	150.9
May	3.3	99,792	954	43.0	16.2	167.1
June	8.0	334,080	1,288	47.77	60.4	227.5
July	8.6	359,136	1,647	48.49	65.9	293.4
August	11.4	443,232	2,139	52.05	87.3	380.7
September	9.8	141,120	2,280	61.17	32.7	413.4

Table 7

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-2

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gallons x 1000)	Average Monthly Concentrations of Total Benzene Species Recovered (mg/l)		Cumulative Total Benzene Species Recovered (kilograms)
				Total Benzene Species	Recovered Species	
January	----	----	72,000	72	72	62.7
February	----	----	36,000	108	230.0	31.3
March	2.5	72,000	183,744	292	230.0	160.0
April	2.5	36,000	200,448	492	243.19	184.5
May	4.4	183,744	209,408	651	252.64	254.0
June	4.4	200,448	252.64	788	255.41	438.5
July	4.8	209,408	137,086	137,086	132.5	590.9
August	3.8	137,086	723.4	723.4	723.4	723.4
September	3.4					

---- Pump Inoperable

Table 8

**Monthly and Cumulative Montior Well Pumpage
and Contaminant Recovery**

Recovery Well RW-3

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Average Monthly Concentrations of Total Benzene Species Recovered (mg/l)			Cumulative Total Benzene Species Recovered (kilograms)
			Total Benzene (gallons x1000)	Cumulative Total Benzene (gallons x1000)	Species Recovered (kilograms)	
January	---	---	---	---	---	---
February	---	---	---	---	---	---
March	---	---	---	---	---	---
April	---	---	---	---	---	---
May	---	---	---	---	---	---
June*	7.1	184,032	184	77*	53.6	
July	7.3	304,848	489	77*	88.8	
August	7.8	334,368	823	77*	97.4	
September	7.0	282,240	1,105	149.58	159.8	
						399.6

---- Pump Inoperable

* Estimated concentration, sample was not collected.

Table 9

Monthly and Cumulative Montior Well Pumpage
and Contaminant Recovery

Recovery Well RW-4

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Average Monthly Concentrations of Total Benzene Species Recovered (mg/l)			Cumulative Total Benzene Species Recovered (kilograms)
			Total Cumulative Pumpage (gallons x1000)	Total Benzene Species (mg/l)	(kilograms)	
January	6.3	281,232	281	44.02	46.9	46.9
February	7.1	286,272	567	35.09	38.0	84.9
March	5.5	245,520	813	61.28	56.9	141.8
April	5.2	224,640	1,037	83.8	71.3	213.1
May	4.0	149,760	1,187	52.14	30.0	243.1
June	4.3	173,376	1,360	51.1	33.5	276.6
July	7.0	292,320	1,652	40.77	45.1	321.7
August	9.7	416,016	2,068	41.61	65.5	387.2
September	9.3	374,976	2,443	55.14	110.6	497.8

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Table 10
Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery
Recovery Well RW-1, 2, 3 and 4

Month	Total Monthly Pumpage (gallons X1000)	Total Cumulative Pumpage (gallons X1000)	Cumulative Total Benzene Species Recovered (kilograms)	
			Cumulative Species Recovered (kilograms)	Total Benzene Species Recovered (kilograms)
1989				
January	522	522	90.0	90.0
February	483	1,005	64.2	154.2
March	450	1,455	101.9	256.1
April	505	1,960	170.6	426.7
May	284	2,244	46.2	472.9
June	874	3,118	93.9	566.8
July	1,156	4,274	384.3	951.1
August	1,353	5,627	402.6	1,353.7
September	935	6,562	435.6	1,789.3